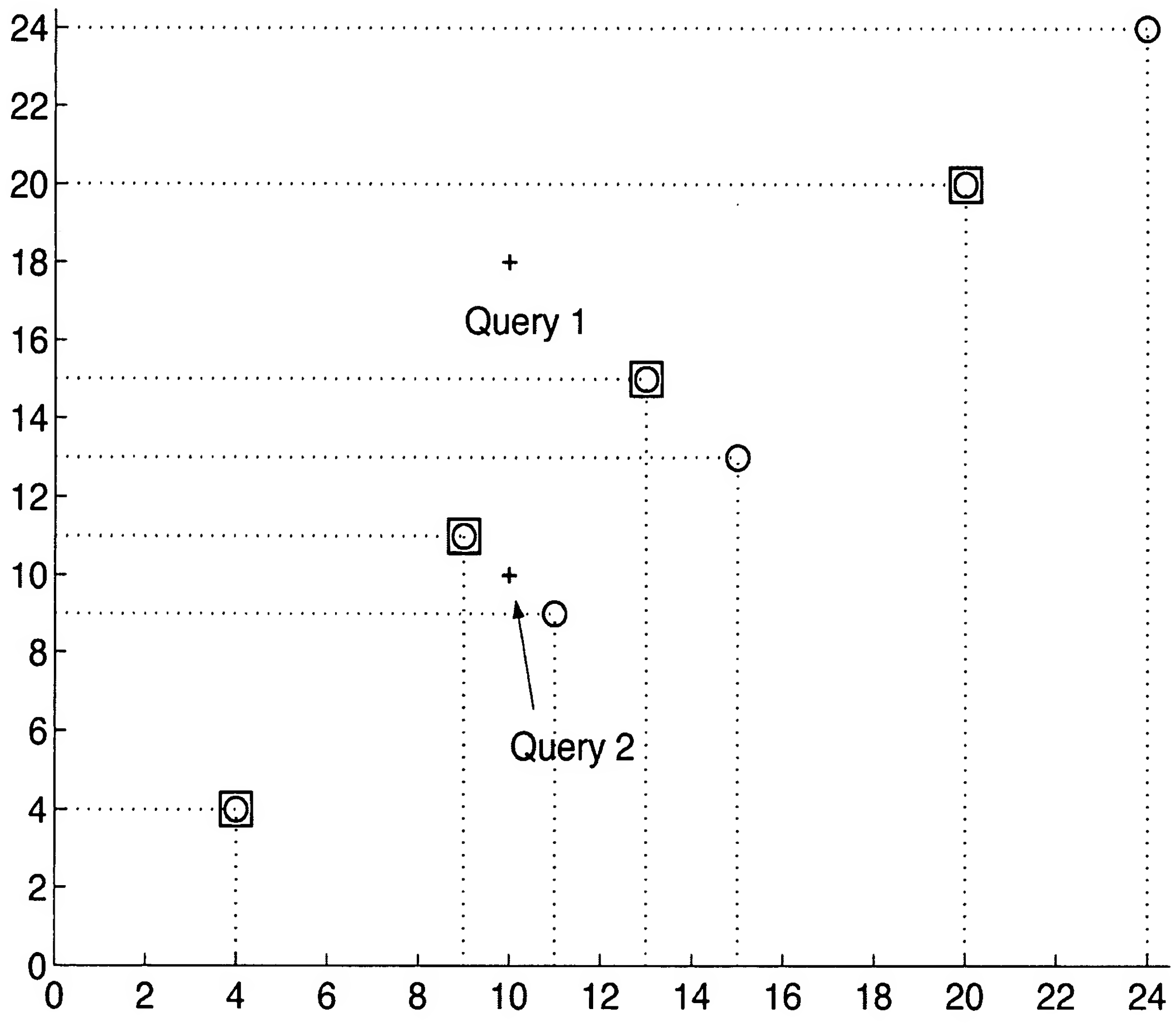

24
22
20
18
16
14
12
10
8
6
4
2
0
0
2
4
6
8
10
12
14
16
18
20
22
24
Query 1
Query 2

FIG. 1

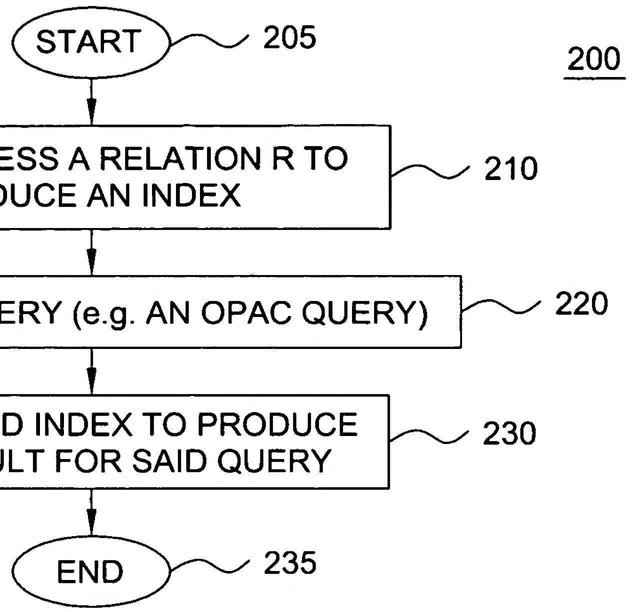

START
205
200
PREPROCESS A RELATION R TO PRODUCE AN INDEX
210
RECEIVE A QUERY (e.g. AN OPAC QUERY)
220
APPLY SAID INDEX TO PRODUCE A RESULT FOR SAID QUERY
230
END
235

FIG. 2

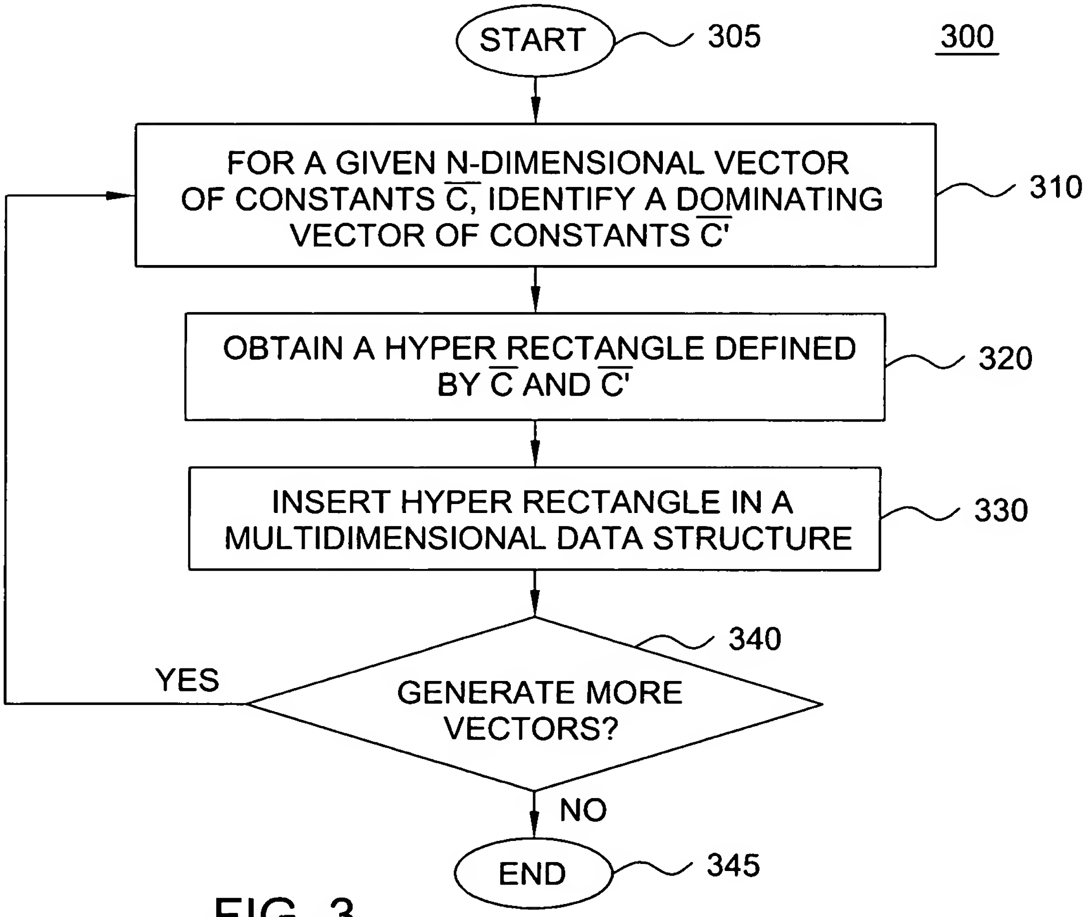
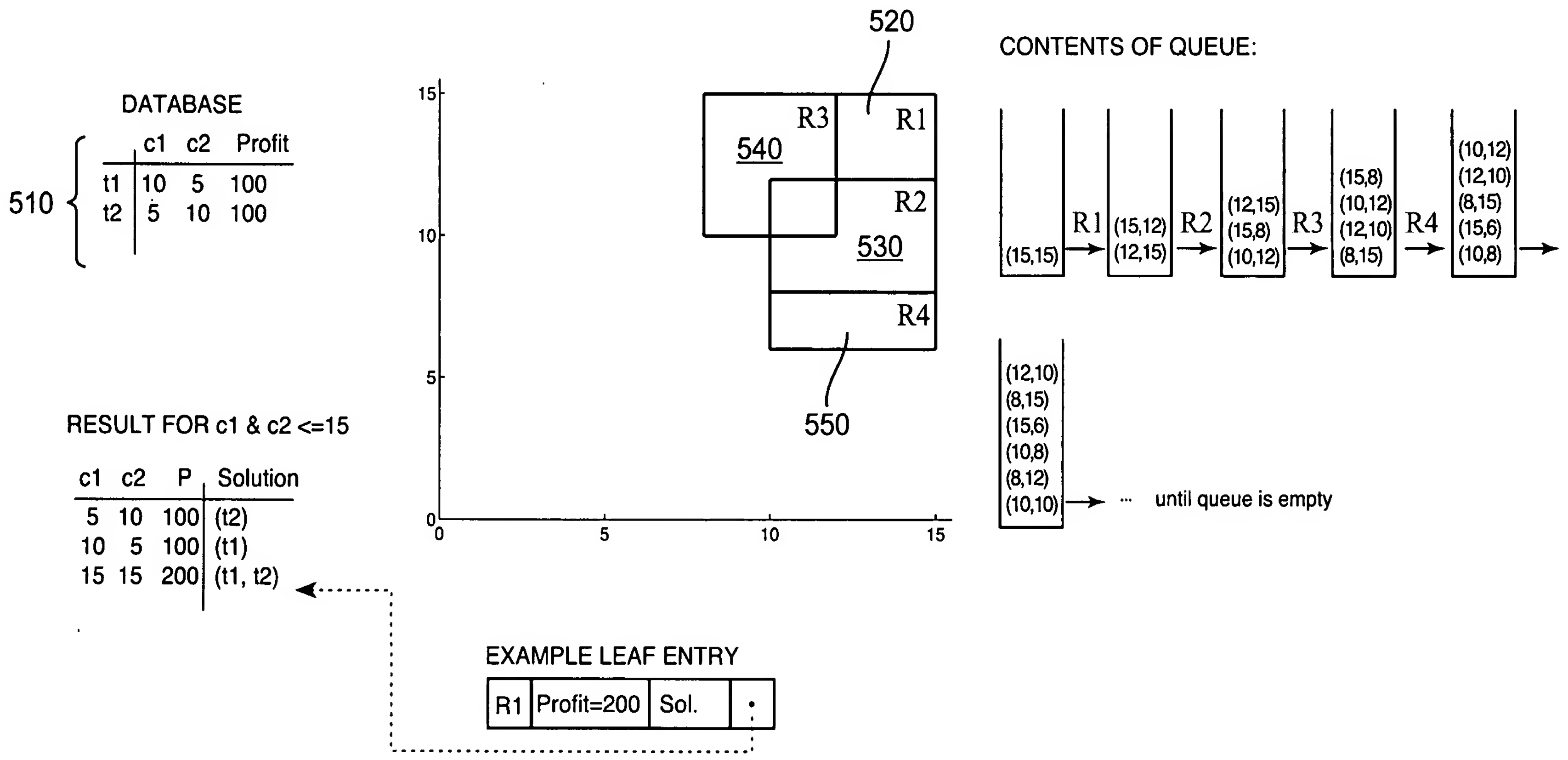

START
305
300
FOR A GIVEN N-DIMENSIONAL VECTOR OF CONSTANTS $\overline{C}$, IDENTIFY A DOMINATING VECTOR OF CONSTANTS $\overline{C'}$
310
OBTAIN A HYPER RECTANGLE DEFINED BY $\overline{C}$ AND $\overline{C'}$
320
INSERT HYPER RECTANGLE IN A MULTIDIMENSIONAL DATA STRUCTURE
330
GENERATE MORE VECTORS?
340
YES
NO
END
345

FIG. 3

```
Algorithm GeneratePartitions($\epsilon, \epsilon'$, $D$)

 Initialize:
    Q: Queue of multidimensional constraint vectors
    $\mathcal{R}$: R-tree
    $s, c, c'$ : constraint vectors
       each coordinate of $s$ is initially set to be
       equal to $D$ and, and $s$ is added to Q

while Q not empty
    $\bar{c}$ = headof(Q)
    $(r, \bar{C}, p, S)$ = LocateSolution($\bar{c}$)
    if there is no rectangle $r'$ in the R-tree $\mathcal{R}$
     that contains rectangle $r$ and $r$ not NULL
        Insert $(r, p, \bar{C}, S)$ to the R-tree $\mathcal{R}$
        by storing $(r, p, \bar{C})$ in a leaf index entry
        and maintaining a pointer to the set of
        tuple identifiers in the solution $S$ on disk
        CreateFront(Q,r)
    endif
end-while


Algorithm LocateSolution($\bar{c}$)

Input: constant vector $\bar{c} = (c_1, \ldots c_n)$
Output: $(r, \bar{C}, p.S)$
(p,S) = MultiKnapsack($\bar{c}$)
if (S is NULL) return (NULL, NULL, 0, NULL)
for i = 1 to n
    $c_i' = \frac{c_i}{1+\epsilon}$
$(p', S')$ = MultiKnapsack($\bar{c'}$)
if ($S'$ is NULL) return (NULL, NULL, 0, NULL)
if ( $(1+\epsilon')p' > p$ )
    while ($p' \geq \frac{p}{1+\epsilon'}$)
        $\bar{c}_t = \bar{c'}; p_t = p'; S_t = S'$
        for i = 1 to n
            $c_i' = \frac{c_i'}{1+\epsilon'}$
        $(p', S')$ = MultiKnapsack($\bar{c'}$)
    end-while
    return (FormRect($\bar{c}_t$,$\bar{c}$), $\bar{c}_t$, $p_t$, $S_t$)
else
    return (FormRect($\bar{c'}$, $\bar{c}$), $\bar{c}$, p, S)
```

FIG. 4



DATABASE

510

	c1	c2	Profit
t1	10	5	100
t2	5	10	100

RESULT FOR c1 & c2 <=15

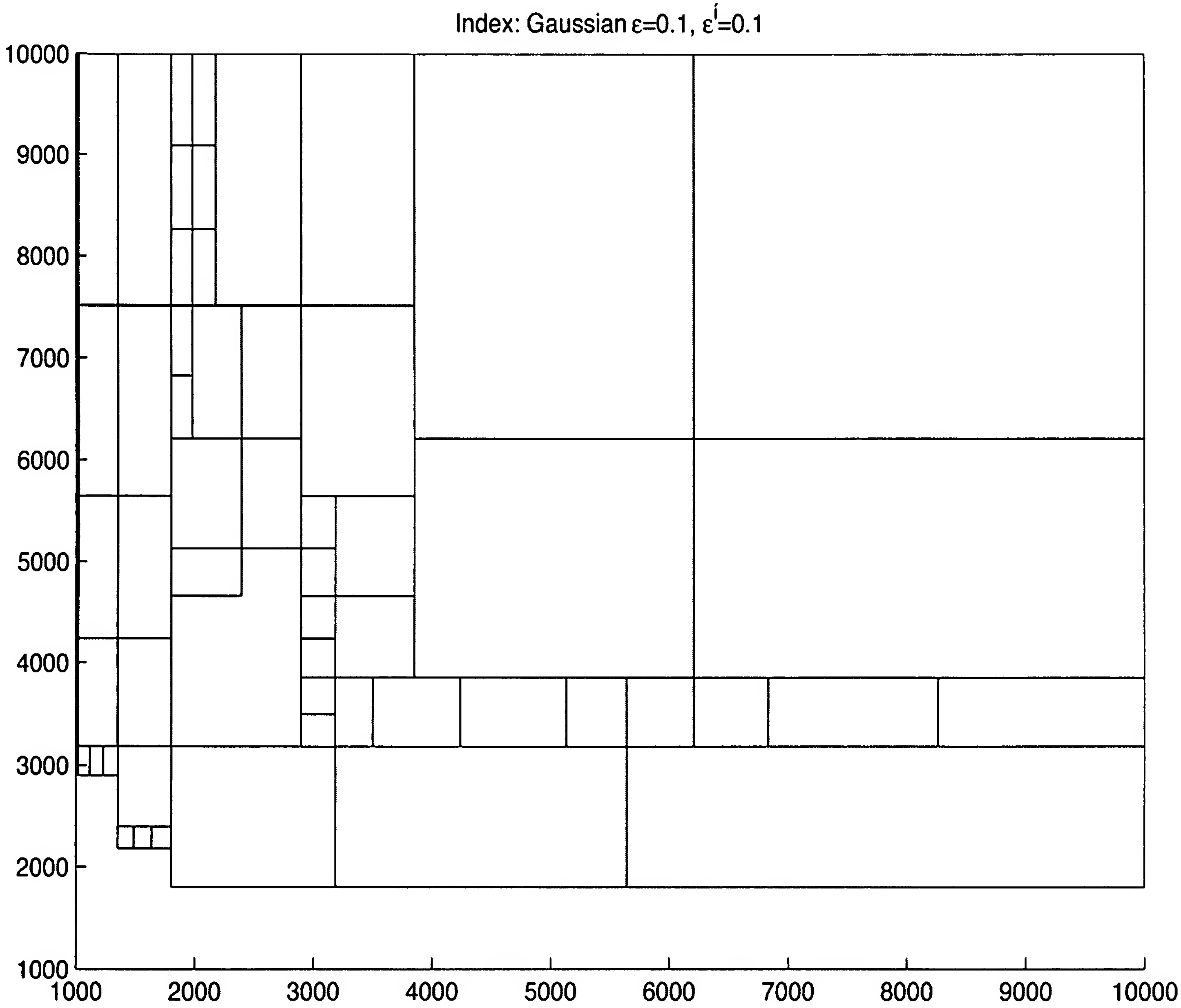
c1	c2	P	Solution
5	10	100	(t2)
10	5	100	(t1)
15	15	200	(t1, t2)

EXAMPLE LEAF ENTRY

R1	Profit=200	Sol.	•

CONTENTS OF QUEUE:

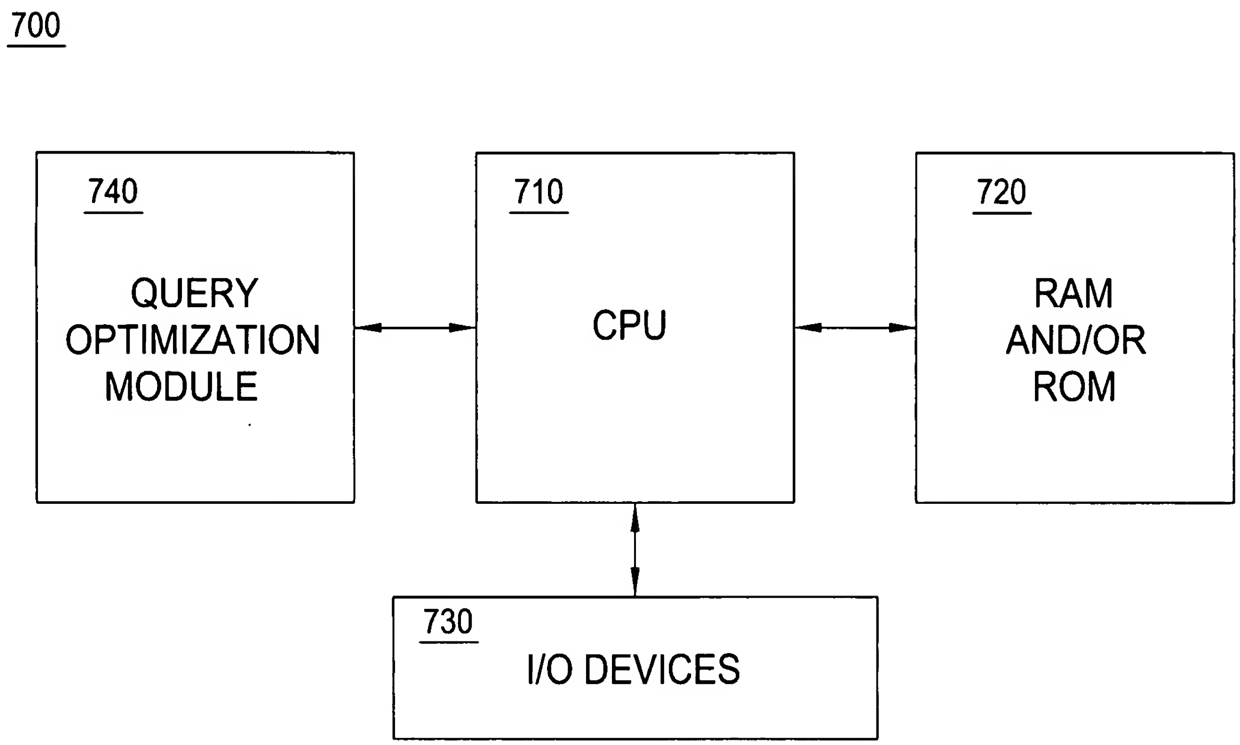
FIG. 5



Index: Gaussian $\varepsilon=0.1$, $\varepsilon'=0.1$

FIG. 6

FIG. 7


700
740
QUERY OPTIMIZATION MODULE
710
CPU
720
RAM AND/OR ROM
730
I/O DEVICES